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ABSTRACT

Intended as a method of increasing children's learning from commercial television by providing supplementary educational commentary on a simultaneous radio broadcast, this study was designed to explore the potential of dual audio instruction as a mass educational system by determining the medium's practicality, the rate of voluntary usage, the amount of material learned, the amount of verbal interaction due to dual audio, and the general reactions of parents, teachers, and children. A field experiment was conducted involving 872 inner-city first and second graders over a 2 month period. Results of the study indicated that it was possible to make and maintain all the necessary arrangements for broadcasting dual audio television, and that the dual audio supplement increased the television program's share of the available television audience. The use of viewer-owned FM radios was shown to be a feasible way of receiving dual audio instruction. (RB)

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A MASS BROADCAST SIMULATION

Terry Borton, Leonard Belasco, Thomas Echewa

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DUAL AUDIO TV INSTRUCTION

A MASS BROADCAST SIMULATION[1]

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How can the American child, who watches commercial entertainment TV an average of 24 hours a week (Lyle and Hoffman, 1972) be helped to learn more from such a major investment of time and attention? Given the wide range of material which could be learned from programs such as "The Waltons," "Spiderman," or "The Brady Bunch," many researchers have wondered why watching entertainment TV does not produce a larger increase in vocabulary, reading level, or general knowledge. (See learning research reviews by Maccoby, 1964; Cazden, 1966; Harrison and Scriven, 1969. Gans (1968) and Gattegno (1969)

[1]The research described in this study was made possible with funds received through Title III of the Elementary and Secondary Education Act.

[2]We wish to express our appreciation to WPHL-TV and WUHY-FM, Philadelphia, for their help in broadcasting; to the distributors of "Spiderman" for permission to use their program; to the staff members of the Darrah, Gideon, Kelly, Meade, Morris, Reynolds, and Sartain schools for their cooperation in data collection; and to Steven Baskerville, for his skill in creating the "voice" of dual audio television.

describe skills which children do learn from TV.) Initial studies have indicated that learning while watching commercial TV can be increased if children listen to a simultaneous "dual audio" radio broadcast which teaches during the silences in the TV program. The purpose of this study was to clarify the potential of such dual audio television instruction as an effective mass educational medium.

Dual Audio Television Instruction

Dual audio TV instruction consists of educational commentary about a commercial TV program. The dual audio instruction is broadcast over an FM radio station while the TV program is on, but the instruction occurs only during the "quiet times" in the program. The instruction is closely related to the content of the program, and uses that content as examples for teaching vocabulary or problem-solving skills. The dual audio instructor's material is prepared by first previewing the TV program, selecting aspects which lend themselves to educational treatment, and then writing a script. For instance, when the TV hero "Spiderman" is battling a giant vine, the dual audio instructor might talk about how normal plants grow, where they get their energy, and how the child himself grows in similar ways. Jokes, songs, and stories help to make the dual audio instructor a "personality" that children enjoy.

The dual audio instruction is synchronized with the TV program either by broadcasting it live, by transferring the filmed program to wide band video tape and adding the dual audio commentary to the cue track, or by taping the dual audio commentary on magnafilm and running it together with the program film on an inter-locked syncromesh tape recorder. In all of these systems the instructor's comments are interspersed throughout the show, and the children have the impression that someone on the radio is watching TV with them

and talking about the program. The children listen to the dual audio program on an FM radio while watching TV with the TV sound at its normal level.

Survey of the Literature

There is little indication in the literature, other than previous studies on dual audio instruction itself, that such a methodology could be an effective means of making commercial TV more educational.

Discussion of multi-channel reception of information (such as dual audio seems to imply) has concentrated mainly on what happens when discrepant information is received simultaneously from several sources or over different visual or aural channels. The research is voluminous (See reviews by Hartman, 1961; Hsia, 1971), but does not contribute much to an understanding of dual audio instruction because the dual audio information is not simultaneously received, nor discrepant. The dual audio voice does not talk at the same time as the TV characters are speaking, and a concentrated effort is made to keep the narration from jerking the child away from the context of the program.

The literature of instructional television (ITV) is not very helpful in illuminating the problems of dual audio, because almost all of these studies are concerned with the comparative effects of live vs. televised instruction. (See review in Briggs, et al., 1967.) While early formative research on Sesame Street (Reeves, 1970) and later more reflective discussions (Lesser, 1972) have been helpful to us in understanding the reactions of children to TV and in developing instructional strategies, they do not clarify what happens when a regular program is supplemented with additional information.

The most directly relevant research is that done with audio or visual supplements to instructional films. Kantor's (1960) study used both visual and aural supplements, with eight questions inserted into a ten minute film, and found no significant differences in what was learned. In the aural approach, the narration of the film was completely re-done. The effect was to make these questions into rhetorical comments of the film's narrator, which may account for the lack of significant differences in learning. Davis (1965) went to the opposite extreme. Using both visual and aural approaches, he repeated one of four messages every two seconds and found significant differences in student learning. As might be expected, he also found that students were antagonized by the constant jarring interruption of the program they were watching, and did not want to repeat the experience.

Studies of Dual Audio Television

Previous studies specifically conducted on dual audio instruction have indicated that providing supplemental information to commercial entertainment TV shows can make a significant difference in what children learn from watching such programs. One study (Borton, 1971), conducted with two hundred children who watched ten minute selections of TV in small groups under simulated home conditions, showed statistically significant differences in amount of material learned by children watching TV with a dual audio supplement. Children watching with dual audio were also much more active viewers than controls, making four times as many verbal and gestural reactions to the TV program. (The article in which this study is reported also contains a discussion of the feasibility of dual audio instruction, psychological implications, questions of control, etc.)

A second study (Borton, et al., in press) was a month-long broadcast experiment conducted with seventy primary, inner-city children, using one group of children who watched an afternoon cartoon program at home as they

ordinarily would, and a second group who could also listen to the dual audio if they wanted to on the fix-tuned FM receivers provided. The results of the study showed that all the arrangements with a TV and radio station that are necessary for dual audio could be made and maintained; that the children voluntarily listened to dual audio 83% of the time when they were watching the TV program; that they learned significantly more vocabulary and problem-solving skills with dual audio instruction; that they talked more during the show and that they and their parents liked having dual audio instruction available to them. (The article in which this study is described also contains a more extensive discussion of dual audio TV instruction and a sample script.)

Although it was a field experiment, several aspects of this study limited its ability to predict the feasibility of dual audio as a mass medium: The length of broadcast (one-month) was short, and the sample, though representative of inner-city children, was selected from volunteers, and therefore not random. Children were provided with fix-tuned portable FM radios which undoubtedly created a Hawthorne effect, and would be an expensive aspect of a mass system if necessary for dual audio reception. Parents were heavily involved in monitoring their children's behavior during broadcast, which again probably produced a Hawthorne effect.

Design and Objectives of the Study

The research reported here was intended to overcome many of the limitations of previous studies of dual audio, and to serve as a clearer index of its potential as a mass instructional medium. The study was of the field experiment type, with four treatment groups representing different ways to supplement commercial TV for educational purposes.

The objectives of the study were to test the effectiveness of dual audio programming under different reception conditions (a fix-tuned "project radio" provided by the study staff, and the viewer's "own radio"), and to compare these broadcast dual audio treatments with both ordinary television watching, and television watching supplemented by parental instruction as described in the booklet, "How to Make TV Teach Your Child." Specific objectives and hypotheses were:

1. To ascertain the practicality of conducting dual audio TV instruction over a two-month period, including working arrangements with the TV and radio stations, and maintenance of radios.

2. To ascertain the amount of voluntary listening to dual audio under "project radio" and "own radio" conditions, to ascertain the characteristics of regular listeners, and to ascertain the amount of booklet use. It was hypothesized that a higher frequency of those listening would be regular listeners in the "project radio" group than in the "own radio" group.

3. To ascertain the amount of material learned from watching TV as usual, from watching with the booklet provided, from watching with dual audio received on the project radio, and from watching with dual audio received on the viewer's own radio. It was hypothesized that: (a) Regular listeners to dual audio would obtain statistically higher scores on a test of material learned than would TV watchers or booklet users, (b) Regular listeners to project radio dual audio would obtain statistically higher scores on a test of material learned than regular listeners of own radio dual audio, and (c) Dual audio listening rates would have a significantly positive correlation with test score.

4. To ascertain the effect of dual audio instruction on the verbal interaction of children watching TV under the different treatment conditions.

it was hypothesized that regular listeners to dual audio would make a significantly higher number of comments during TV watching than either TV watchers or booklet users.

5. To ascertain the general reactions of parents, children, and teachers to dual audio television instruction.

Sample

Because of financial and logistical considerations, a formal random sample of inner city poverty children could not be obtained, but a representative sample was chosen in the following manner. Six elementary schools in District 2 of Philadelphia (an inner-city district) were selected for the study. All these schools were located within the same geographic neighborhood, approximately one mile long by one-half mile wide. All the schools were 99% black (District mean, 87%). All had scores on the California Achievement Test (Grade 2, Form B) ranging from 291 to 318 which were close to the District mean of 303 (range of 271 to 345). All were designated as poverty area schools eligible for Title 1 ESEA assistance. The only major statistical difference between the schools was size, ranging from a high of 1358 pupils to a low of 442. Once the schools were matched as described above, they were randomly assigned to one of the various treatment conditions.

Records of all first and second graders (N=1,540) were obtained, siblings removed, and a phone contact attempted. Since phone monitoring was the basis of several measures used in the study, only those first and second graders whose homes could be reached by phone (57% of the total, N=872) were included in the sample (Sample A) used in determining the results for Objectives 2 and 5 (listening rate and general reactions). For Objectives 3 and 4, (verbal interaction and amount of material learned) the 47% (N=417)

of this group (Sample A) who were successfully monitored at least three times was used. The selection of this subsample (Sample B) was necessary since less than three monitorings did not establish a sufficient base to determine individual listening rates which could then be correlated with amount of material learned or number of comments. (The final sizes of individual treatment groups were: 174 in the "own radio" group, 78 in the "project radio" group, 61 in the booklet group, and 104 in the TV watchers group.) An examination of both Samples A and B for distributions of sex, grade, and achievement level indicated that each treatment group was close to the mean of the district population except for the "own radio" group which was skewed toward first-grade high achievers, and the TV watchers group which was skewed toward second grade low achievers.

The final samples then, consisted of black, poverty, inner-city first and second graders who could be reached by phone--at least once for Sample A, and at least three times for Sample B. It should be noted that these children were not necessarily TV watchers, nor "Spiderman" watchers, nor respondees to information about dual audio, nor volunteers for the broadcast simulation. As much as was feasible, they were selected to reflect the usual TV habits of the population. After the broadcast simulation, the children in the dual audio groups were designated "regular listeners", "occasional listeners" or non-listeners" (defined below) on the basis of their listening rates. Regular listeners were then statistically compared with booklet users and TV watchers to test the hypotheses under Objectives 3 and 4 (material learned and verbal interaction). Since no hypotheses were made about occasional or non-listeners, they were not included in the statistical analysis of these objectives, though data were collected on them.

Treatment Conditions

In order to provide a simulated mass broadcast, dual audio television instruction was aired throughout the months of April and May, 1973 over the local public radio station. The TV program used was the cartoon "Spiderman," shown every weekday afternoon by a UHF station. "Spiderman" was selected for the dual audio programming because its large audience among the sample population made data collection easier, because the pace of the show allowed adequate time for dual audio instruction, and because it contained less violence than many of the other shows being offered by the cooperating TV station. Although both the TV and the dual audio radio program were broadcast on a mass basis throughout the Philadelphia Metropolitan Area, the study was a "simulated" mass broadcast, since only those children notified through their school knew that the broadcasts were available or how to synchronize them.

All of the "Spiderman" programs were previewed and a chart made up indicating the possible areas for dual audio instruction. The original intention had been to complete all scripts ahead of broadcast and then to construct the curriculum. A teacher's strike, which effectively closed operations for two months, pushed broadcast into the spring rather than the peak audience winter months as had originally been planned, and also made it impossible to complete the scripts ahead of time. As a result, new scripts had to be written while others were being broadcast, and a sequential curriculum was difficult to build. About 80 concepts were taught, ranging from those with which the children might already be familiar (growing, magic, leading) to those which they were unlikely to know (resisting, fantasizing, ego). Some were mentioned only once during the broadcast; others were repeated many times.

Four treatment groups were used to assess the effectiveness of the dual audio instruction for "Spiderman."

1. Project Radio. Children were informed that dual audio programming was available for "Spiderman." All children were also informed that a fix-tuned radio could be borrowed from the school. Those who returned the radio-request form received radios on a first-come, first-served basis. Radio repair and batteries were available weekly for the first six weeks.

2. Own Radio. Information on the availability of the dual audio instruction was the same as above, but no radio was provided. Information was given children and parents on how to use their own multi-station FM radios to receive dual audio programming.

3. Booklet. A booklet, "How to Make TV Teach Your Child," was given to the children to take home to their parents. The booklet told parents how to provide their own dual audio instruction for their child. The parents and children were not informed of the availability of broadcast dual audio instruction, but received bi-weekly flyers describing words that could be learned from "Spiderman"--the same words being taught by broadcast dual audio instruction.

4. Television Watchers. These children watched TV just as they ordinarily would, without knowledge of the availability of broadcast dual audio instruction, without a radio, and without a booklet.

These basic treatment variables represented various approaches to learning from regular commercial TV programming. Though it was not expected that the booklet would prove to be an effective instructional strategy, it provided a potential way to get more personal "dual audio" instruction (since it came from the child's own family) and to do so much more cheaply than broadcast dual audio. The "project radio" group provided an opportunity to replicate the previous study using less reactive measures. The treatment with the greatest practical implications was the "own radio" group. Previous research had indi-

cated that 79% of inner city families already had FM radios. If these radios could be effectively used for dual audio reception, there would be a substantial saving in projected cost and complications over those of a mass dual system in which radios had to be provided.

Dependent Variables and Measures

1. Usage Rates. Usage rates were defined as the percentage of time that a child was actually watching TV, watching "Spiderman," or listening to dual audio when called by a monitor. Usage rates were determined by monitors trained by the study staff in pre-test role-playing situations, and additional bi-weekly training meetings. They called the children's homes every two weeks at the time the program was actually on the air and interviewed a parent or older child. Monitoring forms were constructed so that it was difficult for either the monitor or the respondee to fake information. Estimates of the amount of dual audio listening were also obtained from the children at the end of the test to provide a cross check on the monitoring measures. Both of these measures avoided the reactive effects of the daily parent-monitoring forms used in the previous broadcast study.

"Regular listeners" to dual audio were defined as those children who were actually listening to dual audio 50% or more of the times they were monitored, and who themselves also indicated at the end of the study that they "often" listened to dual audio.

"Non-listeners" to dual audio were defined as those children who were never listening when called by the monitors, and who themselves indicated at the end of the study that they rarely or never listened to dual audio.

"Occasional listeners" to dual audio were defined as those children who were actually listening to dual audio between 25% and 49% of the times monitored, or those children who had discrepant reports on listening from the monitors and

the child. Thus if the monitoring showed the child to be listening 75% of the time but the child said he rarely listened, he was classified as an "occasional listener."

"Booklet users" for Objective 2 (usage rate) were defined as those children whose parents reported using the booklet at the time they were called by the monitors. Since there was only one child who met this criterion, "booklet users" was redefined to an "expanded group" for Objectives 3 and 4, encompassing any child whose parents reported ever using the booklet.

2. Material Learned. Amount of material learned was defined as the number of correct scores on a test of the material which had been taught on the dual audio broadcasts and sent to the booklet group. There were 80 vocabulary items tested, randomly divided into four subtests of 20 items each, and children were randomly given one of the four subtests. To check on randomization, some children were given two of the subtests; correlation coefficients between subtests scores ranged from .74 to .91. The test items were single vocabulary words which were administered in an individual oral testing situation in the week after the broadcast period. The words were given without any context or "hints," but were repeated at least twice to make sure that the child knew what he was being asked. Questions were in a form such as, "Can you tell me what _____ means?" or "What does _____ mean?" Testers were trained by the study staff and provided with a list of correct answers; any questionable responses were not scored but written down verbatim and reviewed later by the study staff.

Media-specific tests were considered as being more directly related to the independent variable (Schueler and Lesser, 1967), but rejected because the intent of the dual audio instruction was that the learning be transferred to other settings. Though a good argument can be made for using more broad-gauged standardized instruments, as Sprigle (1971) and Voyat and Lesser (in press) have done

in criticizing the "Sesame Street" research of Ball and Bogatz (1970), the amount of dual audio narration used in this study was too limited to produce changes which would register on these tests, so the "Sesame Street" approach of using program-related tests was followed.

3. Verbal Interaction. Amount of verbal interaction was defined as the number of separate TV or dual audio-related comments made during the TV program, regardless of length. Monitors obtained estimates from parents of how much children talked during the program. It should be noted that this was an extremely crude measure, since the parents were not used to thinking about how much their children talked during TV, and had no way of keeping an accurate count. However, the more precise methods of actual count or verbatim reports from parent monitors which were used in the previous broadcast study had the disadvantage of being quite reactive. Since the primary purpose of this study was to determine listening rates and direct educational outcomes in a simulated mass situation, the less reactive though less precise measure was selected.

4. General Reactions. General reactions to dual audio were determined through a phone interview conducted with parents of those children who had received information about the dual audio broadcasts (Sample A).

Statistical Analysis

Objective 1 (practicality) required no statistical analysis. Objective 2 (usage rates) was analyzed with a chi square to compare the frequency of regular listeners in the project radio and own radio groups. Objective 3 (material learned) was analyzed with a one way ANOVA for unequal n's, and protected multiple t tests within the significant F to test the significance of differences between groups. A Pearson's correlation was used to determine the relation of listening rate and test score. Objective 4 (verbal interaction) was analyzed with a one way ANOVA for unequal n's. Objective 5 (general reactions) required no statistical analysis.

A .05 level was set as significant for all analyses in order to give an estimate of the strength of differences, though because the samples were not randomly selected, significance levels do not indicate statistical generalizability to the larger population.

Results

Objective 1. The practicality of conducting dual audio TV instruction was put to a two month test during the study period. In general, working arrangements were satisfactory, and harmonious relations were maintained with the TV and radio stations. Among the chief difficulties were various problems in maintaining the magnafilm syncromesh system, causing dual audio instruction to go off the air twice. While the magnasynch system was cheaper than the film-to-tape transfer system used in the previous broadcast test, it was prone to more breakdowns, both human and mechanical. Further work is needed to make it more reliable.

An important aspect of maintaining cooperative relations with the TV station in the event of a mass broadcast would be the effect of dual audio broadcasting on the percent of children watching the TV program being supplemented. Figure 1 indicates the percent of TV watchers in each treatment group who were watching "Spiderman" during the eight-week period.[3]

Insert Fig. 1 about here

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[3]See next page for footnote.

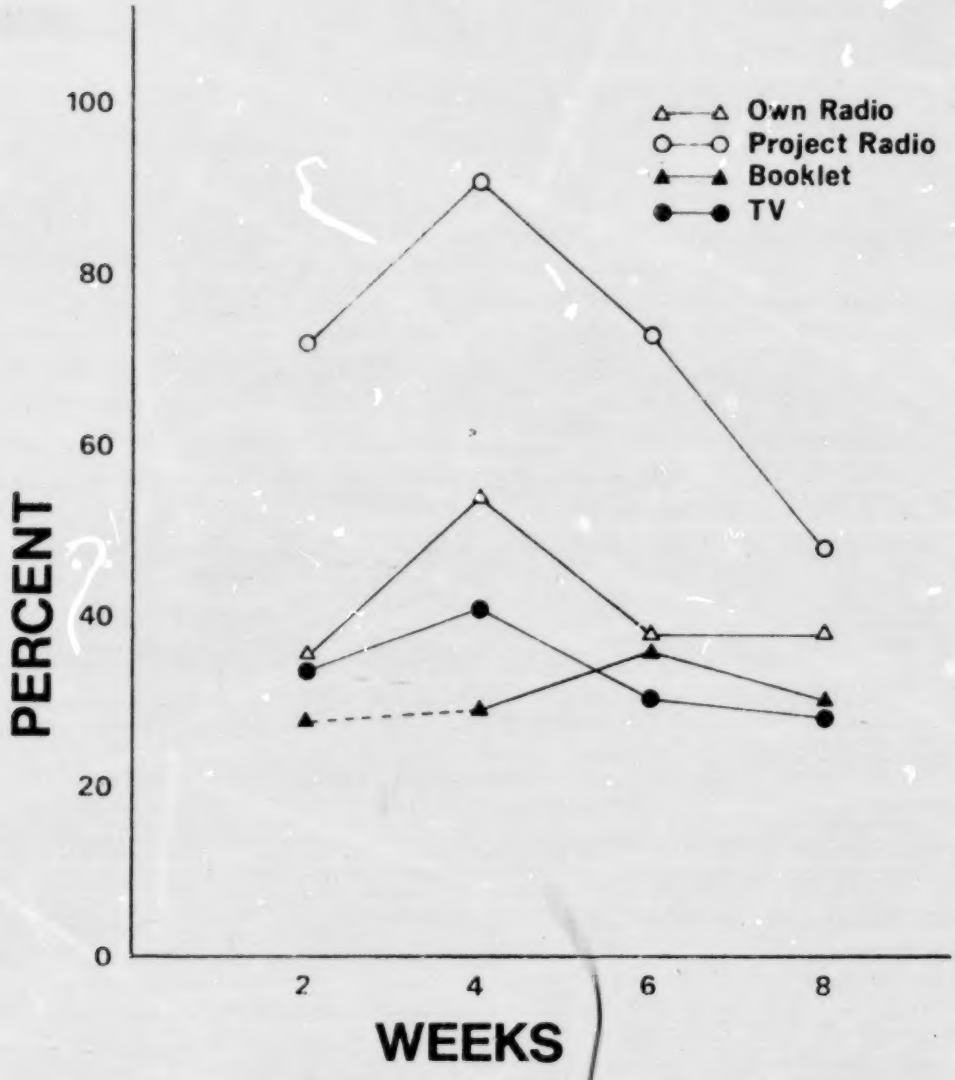

Figure 1: Percent of TV Watchers Watching "Spiderman" by Weeks

While the TV and booklet groups hovered quite consistently around their means of 34% and 30% respectively, the "own radio" group was consistently higher (Mean, 41%) and the "project radio" group much higher (Mean, 71%), reaching a peak of 91% and then dropping in the last few weeks of the test. In both groups, however, dual audio increased the proportion of TV watchers who were watching "Spiderman."

Relations with the schools were uniformly cordial, and during the period when the children were being informed about the dual audio programming, there was considerable excitement in the school.

In the school where radios were offered, about one third of the students (N=85) availed themselves of the opportunity. During the first six weeks of the broadcast period, weekly visits were made to the school to repair or replace radios which were not working. Getting children to bring the radios to school for repair proved difficult; many complained of problems but did

[3] The original tabulation of monitors' reports showed a surprising increase in the TV group in the last quarter. A check indicated that one monitor had misunderstood her directions for that period, so her tabulations were removed and only those of other monitors used. Results reported in both Figures 1 and 2 are for Sample A, the larger and hence more accurate sample. A comparison was made with the subsample (Sample B) used to correlate listening rate and test score, and though there were slight individual differences, the overall pattern was the same. Booklet rates for the first two weeks are represented by a dotted line in both Figures, as incomplete data was received on this group.

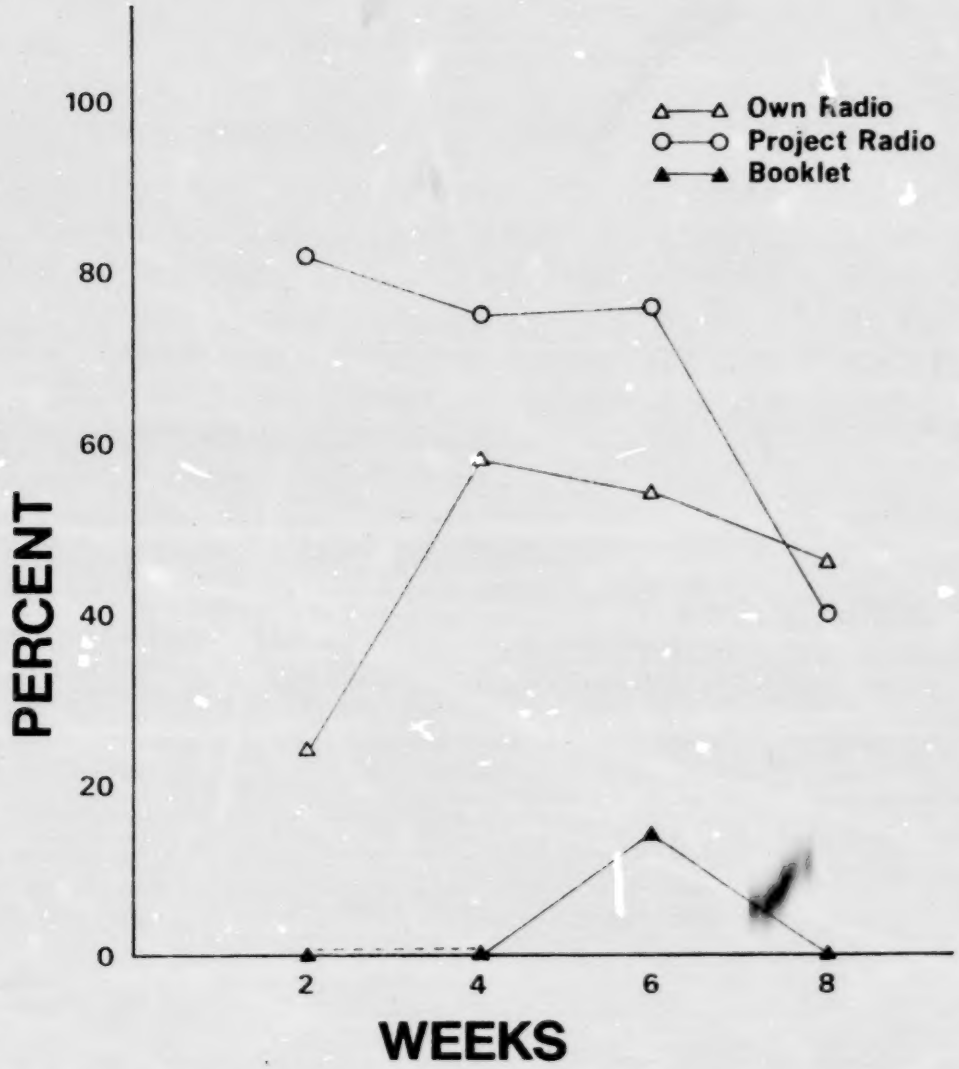

Figure 2: Percent of "Spiderman" Watchers Listening to Dual Audio or Using Booklet

not bring the radio in. The most recurrent problem with the radios brought in was worn-out batteries; approximately thirty batteries were replaced over the six week period. At the end of the broadcast period, 94% (N=79) of the radios were returned, of which 56% (N=46) were fully operative. Thirty six percent (N=31) had dead batteries, which may account for the sudden drop in project radio "Spiderman" watching in the last two weeks when there was no repair service.

Objective 2. The rate of usage was defined as the percent of "Spiderman" watchers who were also listening to dual audio or using the booklet. (Note that this is not the percent of the total group, or of TV watchers, but a measure of what percentage of a particular TV program's audience was listening to dual audio or using the booklet.) Figure 2 indicates the rate of dual audio listening or booklet use over the eight-week period.

Insert Fig. 2 about here

The "project radio" group maintained a mean of 78% for six weeks (close to the 83% overall mean under similar conditions in the previous broadcast test) but then dropped suddenly in the last two weeks for an overall mean of 69%. (This drop may also be explained by battery failure, as indicated in the discussion of "Spiderman" watching above; The "own radio" group began with a low listening rate, but as the children came to understand how to tune in their radios while watching TV, listening climbed to a mean for the last six weeks of 53%, or an overall mean of 46%. If the means on the first and second half of the broadcast period are compared and used as a test for

the Hawthorne effect, then the "project radio" group shows a Hawthorne effect, but the "own radio" group does not, since the own radio usage rates are considerably higher (51% compared to 35%) in the last half of the broadcast period. The booklet group, as expected, showed very low (3%) usage.

The hypothesis that a higher percentage of those listening in the "project radio" group would be regular listeners was confirmed at the .05 level of significance, since 29% (N=23) of the project radio, and 8% (N=14) of the "own radio" group were regular listeners. These relatively low numbers of regular listeners, it should be noted, are in part a function of the fact that at the end of the broadcast period TV watching was down to a mean of 36% of those monitored. Because the children were not watching TV most of the time, it was obviously difficult to find a group who were watching TV and watching "Spiderman" and listening to dual audio at least 50% of the time. If the test had been made in the winter, as originally planned, TV watching rates would presumably have been much higher, and consequently so would the proportion of regular listeners.

An examination of the characteristics of the combined "project radio" and "own radio" regular listeners group showed that they had the same percentage of students in the upper half of their class academically as did the over-all population. There were twice as many first graders as second, and this difference was due to 85% (N=15) fewer boys in the second grade than the first, perhaps because "Spiderman" watching tends to drop off in second grade. Teachers were asked to describe those students who were identified as regular listeners, and though they saw no overwhelming similarities, they generally characterized them as either "good" or "hard working" students who spoke and read well, were responsible, attended school regularly, and whose parents were interested in their work.

Objective 3. The amount of material learned was analyzed by comparing test scores of regular listeners in the "own radio" and "project radio" groups with booklet users (expanded group) and TV watchers. The mean score for "own radio" regular listeners was 5.5; for the "project radio" regular listeners, 3.9; for the booklet users, 3.3; and for the TV watcher, 3.5. A one way analysis of variance produced a significant F ratio of 3.101 (df 3,161, .05=2.67), so one-tailed t tests were used to test the hypotheses within the protection of the significant F. The hypothesis that the "project radio" group would have significantly higher scores than the booklet and TV group was not confirmed. The hypothesis that the "own radio" group would have significantly higher scores than the booklet and TV group was confirmed at the .005 level. The hypothesis that the "project radio" regular listeners would have significantly higher scores than the "own radio" regular listeners was not confirmed. (Occasional listener and non-listener mean scores were respectively 4.1 and 3.8 for the "own radio" group, and 4.9 and 3.4 for the "project radio" group. Booklet non-users had a mean score of 3.2.)

There was a non-significant correlation of .081 between dual audio usage and material learned in the "project radio" group, and a correlation of .163, significant at the .05 level, for the "own radio" group. Thus, the hypothesis that dual audio usage rate would have a significantly positive correlation with test score was not confirmed for the "project radio" group, but was for the "own radio" group.

In summary, the "own radio" group scored significantly higher on tests than any of the other groups, and also showed the clearest relationship between dual audio usage and test score. Since the use of viewer-owned radios is the reception condition which would be most easy and inexpensive to apply on a mass scale, these statistical results are promising indications of the effectiveness of such a system.

It is difficult to determine more precisely the practical significance of these statistics, because it is not clear what this learning should be compared to outside the experimental condition. However, if translated into the rate of learning new words, they mean that the average regular listener to dual audio could be expected to learn about one new word a week under comparable conditions. There are a number of factors which indicate that this learning rate could be increased considerably. First, if the broadcast period were in the winter, when children watch TV more consistently, they would probably receive much more consistent instruction, and hence learn more. Second, the curriculum used in the study contained items with a wide diversity of initial difficulty, relevance to the child, and degree to which they were emphasized in the dual audio instruction. An analysis of those words which regular dual audio listeners did best on indicated that the curriculum should emphasize "easy" concrete words in the 4,000 - 6,000 ranking of the Word Frequency Book (Carroll, 1971). These words should be ones which the children are likely to hear in a wide variety of contexts, but particularly on the TV program, and should have strong scientific, affective, or school connotations. They should be taught with explicit definitions at least twice in each show for at least five shows. These indications of instructional guidelines should be considered tentative, but can form the base for developing hypotheses about more effective dual audio instruction to be tested formally at a later date.

Objective 4. The estimate of amount of verbal interaction while watching TV was obtained by monitors who asked parents if their child said "nothing" (0), said 1-5 things (1), said 6-15 things (2), or said more than 15 things (3). Using the codings of 0, 1, 2, 3, a mean for each child was computed over all observations. There was little difference between regular listeners of the "own radio" and "project radio" groups, booklet users, and TV watchers. The

mean for regular listeners in the "project radio" group was 1.1, for regular listeners in the "own radio" group 1.0, for booklet users 1.2, and for the TV watchers, 1.2. The F ratio of .525 (df 3,161, .05=2.67) was not significant, so the hypothesis that regular listeners to dual audio would make a significantly higher number of comments during TV watching than either TV watchers or booklet users was not confirmed.

Objective 5. The general reactions of parents to dual audio were obtained by phone from the "own radio" and "project radio" groups after the end of the broadcast test. Interviews were obtained from 44% (N=219) of the group which had been monitored over the phone at some time during the broadcast (Sample A). Of these, 43% (N=94) had not listened to dual audio. Reaction of those parents who had listened to the program was favorable: 67% (N=81) reported liking it "a lot," 29% "some," and 4% "not liking it." The major reasons given for liking it were that it taught kids things, and that it was good for them to learn from the TV if they were going to watch. There were very few complaints: one mother thought the two sound tracks were confusing, one thought the colloquial language used was not good for children to hear, two objected to the violence on "Spiderman." When asked if the dual audio programming bothered any member of the family, 95% (N=110) of those responding said "no."

Most parents felt that dual audio instruction should teach such school subjects as reading and vocabulary (64%, N=48), but 16% (N=12) mentioned teaching children how to behave, commenting specifically on the violence of the gang wars raging in their neighborhoods. While most parents said that hearing dual audio had not led them to make similar comments to their children during other programs, 27% (N=30) said that their child talked like the dual audio instructor during other programs, imitating his manner of speech or the kind of things he would say. A rather surprising 16% (N=28) said that their

child sometimes listened to the dual audio program without watching TV, either because the radio was in a different room from the TV, or because the child was outside playing. About 25% (N=29) said that their child talked more in general and more with adults during TV with dual audio instruciton, as compared to 20% (N=24) who said they talked less, and 50% (N=43) the same. When asked about the effect of dual audio instruction on whether the child thought for himself during the TV programs, 45% (N=47) said their child thought for himself "more," 2% "less," and 40% "the same." Many parents (45%, N=48) reported watching TV and listening to dual audio with their child, mostly on an occasional basis. They also mentioned a variety of things done to increase the dual audio impact, such as repeating words, writing them down for the child, talking to the child about what was happening, and responding to the dual audio questions.

Teacher reaction to dual audio television was limited, as few listened and reported their comments on the forms provided. Those who did respond (N=7) were positive in their general reactions, stressing particularly the usefulness of dual audio in building vocabulary and the excitement their children showed about the program. Evidence was cited that dual audio had some carry-over into school. Suggestions for improving the dual audio programming included using a TV program with less violence in it, supplying back-up material for teachers, explaining words on a more elementary level, reducing the amount of joking, and providing pictures of the dual audio instructor so that he could become as "real" as "Spiderman."

Children's reactions can best be interpreted from the percentages who listened to the program voluntarily, and the degree to which they seemed to learn the material. Almost all of the children in the "project radio" and "own radio" groups knew of the dual audio programming, and 72% said during the test that they listened at least once, compared to 57% reported by their parents. The children had an interesting difference in perception about what the dual audio instructor was doing. An informal survey conducted late in the

testing indicated that about half the children thought that he was teaching about words, or reading, but about half thought that he was teaching about "Spiderman," or actually teaching "Spiderman" himself. There did not seem to be any correspondence between these different perceptions and test scores. One other general comment on children's reactions is in order: All personnel involved with the study were struck by the enthusiasm that children showed when TV was mentioned, particularly when the staff member indicated that he knew about such children's shows as "Spiderman." Anyone who showed an interest in that part of the children's lives was regarded as a friend, which no doubt accounted for some of the fascination with "the man on the radio talking about TV."

Limitations of the Study

The lack of random sampling was an important limitation of the study, because, although the sampling was much more representative than in the previous field study, the results can not be statistically generalized to a larger population. While the combination of phone monitoring and asking the child for a usage estimate gave a reasonably secure measure of usage, no similar check could be performed on number of comments made during TV watching, which was a very rough estimate in any case. Conducting the tests in the spring rather than the winter probably decreased usage rates and test scores, and made it difficult to predict what might happen in a normal winter broadcast period. Finally, all testing was done with program-specific tests, which made it difficult to predict what effect dual audio instruction would have on standardized instruments if it were used on a mass scale over a longer period of time.

Implications for Further Research and Practice

Additional field research needs to be conducted to determine more effect-

ive instructional strategies for dual audio. Preliminary data reported in this study should be helpful in forming the hypotheses for this research. Further evidence needs to be collected on the effects of dual audio instruction on verbal interaction, as the non-significant differences reported here using rough but unobtrusive measures conflict with the significant differences found with more accurate but reactive measures in earlier studies.

Assuming that a more effective instructional program can be developed, the next research step should be a "public broadcast" field experiment--one in which a Metropolitan Area is notified over the TV itself that dual audio is available. Such a public broadcast test would make it possible to analyze the effects of dual audio on many different kinds of populations, and to learn the mechanics necessary for continuing mass broadcasts on a regular basis.

Summary and Conclusions

This study was a simulated mass broadcast of dual audio television instruction, a method of increasing children's learning from commercial TV by providing supplementary educational commentary on a simultaneous radio broadcast. The purpose of the study was to ascertain the potential of dual audio instruction as a mass educational system by determing the medium's practicality; the rate of voluntary usage; the amount of material learned; the amount of verbal interaction due to dual audio; and the general reactions of parents, teachers, and children.

A field experiment was conducted involving 872 inner-city first-and-second graders over a two-month period in which dual audio television instruction was broadcast daily to supplement a popular afternoon cartoon show. The dual audio instruction was received under normal voluntary listening conditions in the children's homes. One group listened on their own FM radios, one group used fix-tuned FM radios provided by the study staff, one group did not know

of the broadcast dual audio but used a booklet providing the same information, and one group simply watched TV as usual.

The results of the study indicated that it was possible to make and maintain all the necessary arrangements for broadcasting dual audio television, and that the dual audio supplement increased the TV program's share of the available TV audience. The use of viewer-owned FM radios was shown to be a feasible way of receiving dual audio instruction, since a mean of 46% of the TV program's audience listened throughout the two months on their own FM radios.

Regular listeners to dual audio instruction on their own radios obtained significantly higher scores on tests of material learned than did TV watchers or booklet users. An analysis of the items of greatest difference indicated ways in which a dual audio curriculum could probably be made more effective in the future. The reactions of parents, teachers, and children to dual audio instruction were generally positive.

This study, conducted as a broadcast simulation, generally confirmed the trend of previous laboratory and field studies on the use and effects of dual audio TV instruction. Because it showed that dual audio could hold a large percentage of a TV audience when heard on radios already available to children, and because regular listeners in this audience scored higher on tests of material learned than any other group, the study indicated that a system of dual audio instruction using viewer-owned radios was feasible. It should be a relatively easy next step to test out such a system in public broadcasts conducted throughout a Metropolitan Area.

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